

FIBERS SITE GROUP

February 3, 2016

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Subject: Groundwater Extraction and Treatment System Sampling, Analysis and Monitoring Program
Fibers Public Supply Wells Site
Guayama, Puerto Rico

Dear Mr. Bosque:

On behalf of the Fibers Public Supply Wells Site Settling Defendants, we are submitting the attached 2016 Groundwater Extraction and Treatment System Sampling, Analysis and Monitoring Program (SAMP) prepared by ARCADIS. Please review and we would welcome the opportunity to discuss any questions or comments.

Please feel free to contact Mr. James Kirschner of ARCADIS at (602) 438-0883 ext. 3204 or me at (724) 544-4874 if you have any questions or comments regarding this submittal.

Sincerely,



Joe Biss, CHMM
Fibers Site Project Coordinator
EHS Support LLC

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**Fibers Public Supply Wells Superfund
Site**

**Groundwater Extraction and
Treatment System Sampling,
Analysis and Monitoring Program**

Guayama, Puerto Rico

January 2016



A handwritten signature in black ink, appearing to read 'Chase McLaughlin'.

Chase McLaughlin
Senior Chemical Engineer

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David B. Howard
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James C. Kirschner
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**Groundwater Extraction and
Treatment System Sampling,
Analysis and Monitoring
Program**

Guayama, Puerto Rico

Prepared for:
Fibers Public Supply Wells Superfund Site

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Date:
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1. Introduction

On behalf of the Fibers Site Group (Fibers Group), Arcadis U.S., Inc. (Arcadis) has prepared this Groundwater Extraction and Treatment System Sampling, Analysis and Monitoring Program (SAMP). This SAMP amends the 2003 Revised Sampling, Analysis and Monitoring Plan (Blasland, Bouck, and Lee, Inc. [BBL], 2003) and modifications in the scope of sampling proposed in the First Semi-Annual Report for 2005 (Arcadis, 2005) and First Semi-Annual Report for 2009 (Arcadis, 2009). This SAMP includes Site background information, a description of the Program, reporting schedule, and proposal to discontinue the sampling and analysis of Total Petroleum Hydrocarbons as Kerosene (TPHk). This report is organized as follows:

- Section 2 – Site Background.
- Section 3 – Groundwater Extraction and Treatment System (GWETS) Sampling, Analysis and Monitoring Program.
- Section 4 – Reporting.
- Section 5 – Proposal to Discontinue Sampling and Analysis of TPHk.

2. Site Background

2.1 Site Location and Description

The Site is located in the Commonwealth of Puerto Rico, approximately 2 miles north of the Caribbean Sea and 1 mile southwest of Guayama, along Puerto Rico Highway 3 (PR-3). Figure 1 is a Site Vicinity Map. The Site encompasses about 540 acres and includes a former fibers manufacturing plant, a Baxter International, Inc. (Baxter) facility, and a former cane field. Wyeth, LLC (Wyeth) currently operates a pharmaceutical development center and warehousing in the former fibers manufacturing plant. Figure 2 is a Site Plan showing the overall layout of the Site, locations of the groundwater production and extraction wells, groundwater treatment system compound and treated water discharge pipeline route.

2.2 Site History

Since the 1960s, several industrial facilities have operated in the vicinity of five former Puerto Rico Aqueduct and Sewer Authority (PRASA) public supply wells located in Guayama, Puerto Rico. Shutdown of the former PRASA public supply wells has been attributed to historical releases from these industrial facilities. A Record of Decision (ROD) was issued in September 1991 selecting a remedy that included pumping

impacted groundwater from extraction wells, treatment by sediment/particulate filtration and air stripping, and long-term groundwater monitoring to assess remedy performance.

In 1992, the Fibers Group entered into a Consent Decree to implement the selected remedy. A Final Design Report was approved in 1995. The 1995 Design Report modified the remedy to include:

- Pumping from five regional extraction wells and two source control wells at a combined rate of 650 gallons per minute (gpm) with a contingency of plus or minus 50%.
- Discharge of treated groundwater to the Patillas Canal or to nearby industrial facilities for reuse.

The GWETS was in operation from September 1999 through May 2013. Groundwater was pumped from the five groundwater extraction wells at a combined rate of approximately 400 to 450 gpm. The groundwater was treated by air stripping and conveyed to the adjacent Chevron Phillips Chemical Puerto Rico Core, Inc. (CORE) facility. Groundwater extraction was suspended in May 2013 due to scaling within the air stripper. Demolition of the packed tower air stripper was conducted in the spring of 2015 and the installation of a new shallow tray air stripper was completed in September 2015. The new air stripper is designed for simple maintenance as scale forms across the trays. New electrical instrumentation and controls were also installed on the system to bring the system up to code and allow for remote monitoring with a supervisory control and data acquisition (SCADA) system. Startup and shakedown of the new system was conducted in September. The GWETS returned to service on September 30, 2015 with full system automated operation commencing on October 7, 2015.

2.3 Constituents of Concern

The primary constituents of concern (COCs) at the Site are chlorinated volatile organic compounds (CVOCs) and haloethers.

2.3.1 CVOCs

The presence of CVOCs at the Site is attributed to minor releases of solvents by the various industrial facilities that have historically operated at the Site. Concentrations of chlorinated organics observed in groundwater at the Site are not indicative of the presence of separate-phase material in the subsurface. Tetrachloroethene (PCE) is the only CVOc that remains present at concentrations exceeding the Groundwater Cleanup Criteria (GWCC) at a limited number of monitoring locations. Daughter products of PCE degradation, including trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride

(VC) have historically been observed in groundwater samples collected at the Site, potentially indicating that microbially mediated reductive dechlorination is actively occurring in some areas.

2.3.2 Haloethers

Haloethers are components of anesthetics and intermediate compounds used in the manufacture of anesthetics. The presence of haloethers at the Site is attributed to three sumps located near the Baxter wastewater treatment system. The current default guideline values of 50 micrograms per liter ($\mu\text{g/L}$) for individual haloethers and 100 $\mu\text{g/L}$ for total haloethers were assigned pursuant to the Puerto Rico Department of Health New Order (2009-546-09, June 2009), in the absence of a risk-based or constituent-specific standard. Haloether concentrations in the majority of the monitoring locations exhibit relatively stable concentrations and many are below the GWCC.

2.4 Current Groundwater Remediation Activities

The GWETS was modified in preparation for the restart of the system on September 30, 2015. The GWETS will extract groundwater from extraction wells RW-2, RW-4 and RW-5 (Figure 2). The treatment system is capable of treating an instantaneous maximum flow rate of approximately 500 gpm (0.72 million gallons per day [MGD]). Extracted groundwater is pumped from the extraction wells to a main piping manifold at the treatment compound. Biocide is added to the main header and the water flows through a static mixer prior to the air stripper influent. CVOCs and haloethers are volatilized from the extracted groundwater using an air stripper (Figure 3) and discharged to the atmosphere through a stack on the air stripper. Treated groundwater in the air stripper sump is pumped through an 8-inch diameter high density polyethylene (HDPE) pipe into a 24-inch diameter corrugated metal discharge pipe outfall structure with final discharge to the Phillips Ditch (Figure 2).

3. Groundwater Extraction and Treatment System Sampling, Analysis and Monitoring Program

The following sections describe the GWETS sampling, analysis and monitoring program, including: program objectives, monitoring and sampling event preparation, and monitoring schedule and locations.

3.1 Program Objectives

The objectives of the GWETS Monitoring Program described in this plan are to monitor influent and effluent concentrations to:

- Evaluate the effectiveness of the GWETS.
- Optimization of the GWETS.
- Confirm effluent discharge CVOCs and haloethers are not detected at the laboratory reporting limit.

3.2 Monitoring and Sampling Event Preparation

Prior to any GWETS monitoring and/or sampling event, preparation activities will be completed. Preparation activities include, but are not limited to, coordinating with the analytical laboratory and ordering sampling containers, and assembling and preparing the required field log forms and Health and Safety Plan (HASP).

3.2.1 Analytical Laboratory Notification

Prior to departing for the Site, the analytical laboratory will be notified of the upcoming sampling event and request delivery of the sufficient number of sample containers needed for the collection of the GWETS samples. The notification will include the number of samples planned for collection, the requested analytical methods for each sample, the specific compounds to report for each analytical method, when and where the sample containers need to be delivered and when the analytical report is required.

3.2.2 Health and Safety Documentation Requirements

In accordance with the project HASP, pre-site preparatory procedures will be understood and site-specific hazards will be addressed. Project team responsibilities regarding health and safety, communications, hazard control and documentation shall be addressed before mobilizing to the Site. Log books and the appropriate field forms required to perform each task will accompany Site personnel at all times while onsite. Appropriate health and safety forms associated with GWETS monitoring are provided in the project HASP.

Before conducting any GWETS monitoring or sampling activities, the GWETS will be visually and auditorily inspected from a distance to make an initial assessment of any unsafe conditions. It should be apparent by the sounds and condition of the operating equipment if the GWETS is functioning properly.

3.3 Monitoring and Sampling Schedule and Locations

GWETS monitoring and sampling activities will be conducted on a monthly schedule. ARCADIS project staff will be responsible for coordination of these activities with field

technicians, compliance tracking, and Operations, Maintenance, and Monitoring (OM&M) Manual table updates. Samples will be collected from influent and effluent locations. The influent sample tap location is located at the influent piping before groundwater enters the air stripper (Figure 3). The effluent sample tap location is located on the 8-inch diameter schedule 80 polyvinyl chloride (PVC) pipe following the two transfer pumps on the air stripper (Figure 3). The influent and effluent sampling schedule is detailed in Table 1.

In addition, field technicians will monitor and record GWETS operating parameters (e.g., flow and pressure) in accordance with the OM&M Manual so that system troubleshooting and appropriate repairs can be made during these visits.

3.3.1 GWETS Monitoring Frequency

Following startup, the GWETS will be monitored on a daily basis at the Site. GWETS parameters will be collected to compare to the digitally recorded system data. Subsequently, GWETS Site monitoring will occur on an approximate weekly basis to ensure efficient system operation until such time a minimum frequency is established (but no less than once per month).

3.3.2 GWETS Sampling Locations and Frequency

Influent samples will be collected and analyzed for volatile organic compounds (VOC) and haloethers on a monthly basis. Effluent samples will be collected and analyzed for VOC and haloethers on a monthly basis to support the evaluation of treatment system performance.

GWETS samples will be collected from the influent sample tap and effluent sample tap. The sample locations and IDs are provided in the table below and on Figure 3.

Location	ID
GWETS Influent	ST-INF
GWETS Effluent	ST-EFF

Samples will be collected for analysis of concentrations of VOC and haloethers. For analysis of concentrations of VOC and haloethers, 40-milliliter (ml) glass vials with Teflon™-faced silicone screw caps prepared with preservative by the laboratory will be filled such that there is no headspace and will be capped tightly. All samples will be preserved on ice or refrigerated and protected from light from the time they are collected until they are extracted by the laboratory.

3.3.3 Laboratory Analysis

Samples collected for analysis of concentrations of VOC and haloethers will be analyzed in accordance with United States Environmental Protection Agency (USEPA) Method 8260.

3.3.4 GWETS Sample Identification Syntax

Each GWETS sample will be given a unique identification number (ID) and be recorded in the field logbook, on the GWETS sampling log, on the label affixed to the sample container, and on the chain of custody. The GWETS sample ID syntax includes descriptive field codes to provide abbreviated information regarding the sample collection location and date. The GWETS sample ID syntax follows the convention: Location-Date.

GWETS sample location codes include:

Location Code	Description
INF	Groundwater Influent Stream
EFF	Groundwater Effluent Stream
DUP	GWETS Duplicate Sample
TB	Trip Blank

The GWETS sample Date code completes the GWETS sample ID. The Date code refers to the GWETS sample collection year (YYYY), month (MM), and day (DD).

An example of a GWETS sample ID for an influent sample collected on September 15, 2015 would be as follows: INF-20150915.

An example of a GWETS sample ID for an effluent sample collected on September 15, 2015 would be as follows: EFF-20150915.

An example of a GWETS sample ID for an effluent duplicate sample collected on September 15, 2015 would be as follows: EFFDUP-20150915.

An example of a GWETS sample ID for a trip blank shipped on September 15, 2015 would be as follows: TB-20150915.

3.3.5 Quality Assurance and Quality Control

Samples collected for analysis of VOC and haloether concentrations must be extracted within 14 days of collection. ARCADIS will implement standard quality assurance/quality control (QA/QC) measures during the sample collection, transportation and chemical analysis process. The primary objective of these QA/QC measures is to ensure that resulting analytical data are reproducible, are of adequate quality for their intended use and are representative of actual conditions. The field QA/QC samples to be collected include field duplicate and trip blank. Each QA/QC sample is discussed in more detail in the following sections.

3.3.5.1 *Field Duplicates*

A field duplicate sample is a second sample collected at the same location as the primary (original) sample (to replicate the primary). Duplicate samples are collected in immediate succession using identical recovery techniques, and treated in an identical manner during storage, transportation and analysis. One field duplicate sample will be collected from the effluent sample tap each month. The duplicate sample will be analyzed for all laboratory analyses requested for the primary sample collected at the Site.

3.3.5.2 *Trip Blank Samples*

Trip blank samples will be used to assess whether Site samples have been exposed to non-Site related volatile constituents during storage and transport or if the potential for cross-contamination among collected samples exist. A trip blank sample will be provided by the analytical laboratory and will accompany each sample cooler. Each trip blank sample will be analyzed for all laboratory analyses requested for the primary samples collected at the Site at a frequency of one per sample delivery group.

3.3.5.3 *Chain-of-Custody*

A chain-of-custody form will be completed to maintain the custodial integrity of the samples. Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in the field and at the laboratory. All samples will be uniquely identified in accordance with the sample ID syntax as described in Section 3.3.4 and documented in the field at the time of collection and recorded on a laboratory provided chain-of-custody or an ARCADIS chain-of-custody form.

4. Reporting

Self-monitoring reports (SMR) will be submitted to the USEPA and Puerto Rico Environmental Quality Board (PREQB). The SMR will include a description of the groundwater remediation system, the analytical results for the influent and effluent performance samples, applicable Reporting Level (RL) and the current Method Detection Limit (MDL), the total amount of groundwater extracted and treated and any operational issues encountered for each month.

The discharger will notify the USEPA and PREQB of any system upsets or noncompliance that may endanger health or the environment within 24 hours from the time the discharger becomes aware of the circumstances. A written submission will also be provided to the USEPA and PREQB within 5 days of the time the discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and, steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

5. Proposal to Discontinue Sampling and Analysis of TPHk

The Fibers Group proposes to discontinue the sampling, analysis and reporting of TPHk in groundwater. The Fibers Group evaluated historical TPHk groundwater concentrations at the Site. TPHk has not been detected in groundwater at the Site above the GWCC (100 milligrams per liter [mg/L]) since sampling and analysis commenced in 1998. In addition, TPHk was last detected in groundwater at the Site in September 2012 (PCMW-1; 0.930 mg/L). Based on the historical TPHk groundwater concentrations, the Fibers Group respectfully requests to discontinue the sampling, analysis and reporting of TPHk.

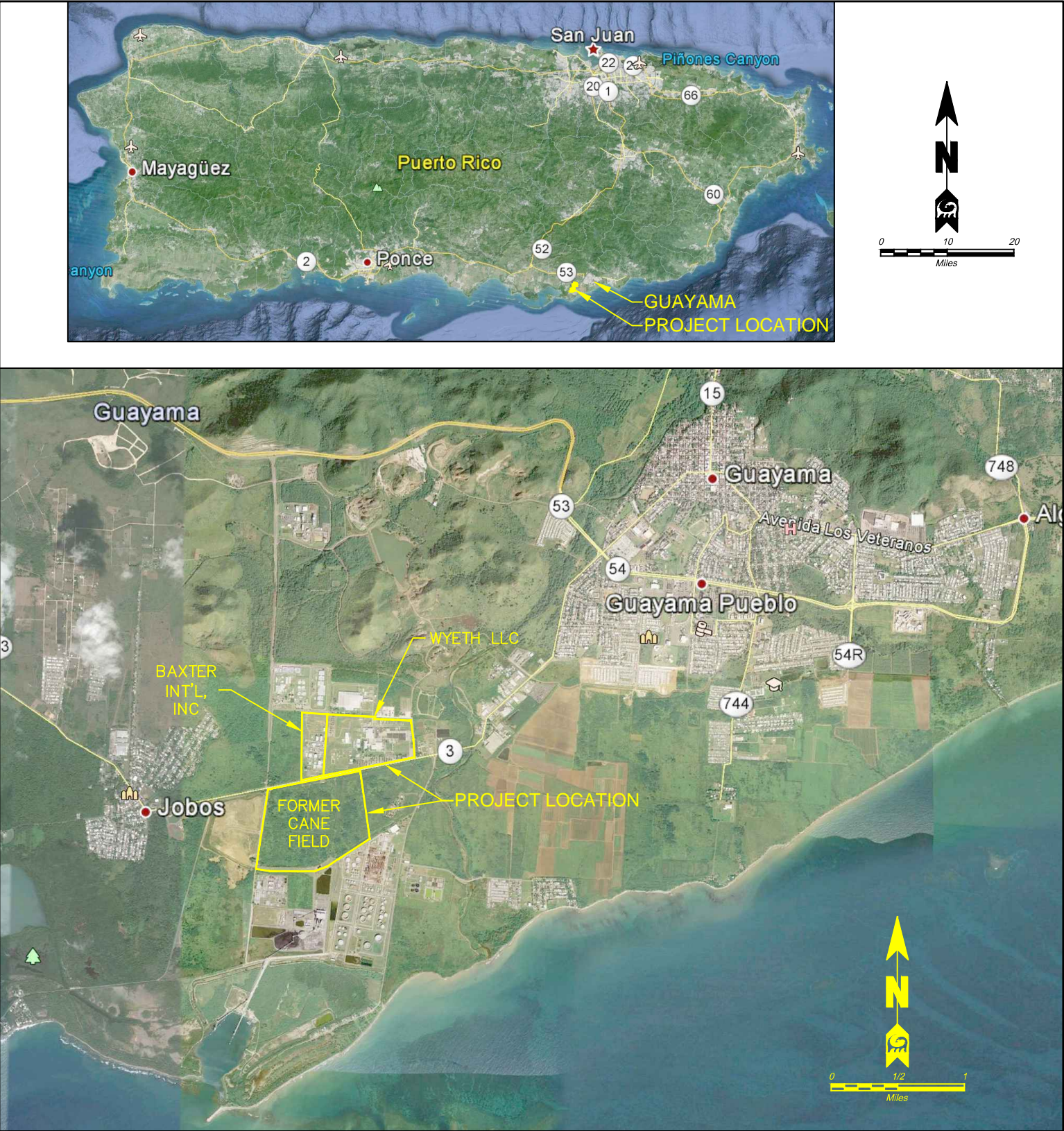
6. References

Arcadis, 2005. *First Semi-Annual Report for 2005*. July 2005.

Arcadis, 2009. *First Semi-Annual Report for 2009*. September 2009.

Blasland, Bouck & Lee, Inc., 2003. *Revised Sampling, Analysis, and Monitoring Plan*, Revision 1.0. March 2003.

Figures



AERIAL PHOTOS COURTESY GOOGLE EARTH © 2014

FIBERS PUBLIC SUPPLY WELLS SUPERFUND SITE
STATE ROAD P.R. #3, KM 142.1, GUAYAMA, PUERTO RICO
SAMPLING, ANALYSIS AND
MONITORING PROGRAM

SITE VICINITY MAP



SOURCES:
ELECTRONIC FILE FROM
CARIBBEAN AERIAL SURVEYS, INC.
DATED MARCH 2011.
FILENAME: 2772-ALL-NAD83-METER-ADJUST.
ZONE: 5200-PUERTO RICO/VIRGIN ISLANDS
HORIZONTAL DATUM: STATE PLANES
NAD83 U.S. SURVEY FEET
VERTICAL DATUM: NGVD29

LEGEND
● GROUNDWATER EXTRACTION WELL
● GROUNDWATER PRODUCTION WELL
● GROUNDWATER PRODUCTION WELL (CURRENTLY NOT IN USE)
PR-3 PUERTO RICO HIGHWAY 3
— DISCHARGE PIPELINE ROUTE
— EXISTING EASEMENT
— FIBERS SITE BOUNDARY

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		SHEET TITLE		PHASE/TASK NUMBER .0002.1516A	DRAWN BY R. KOSCIOLEK
		SITE PLAN		PROJECT NUMBER C0001911	DRAWING NUMBER 2

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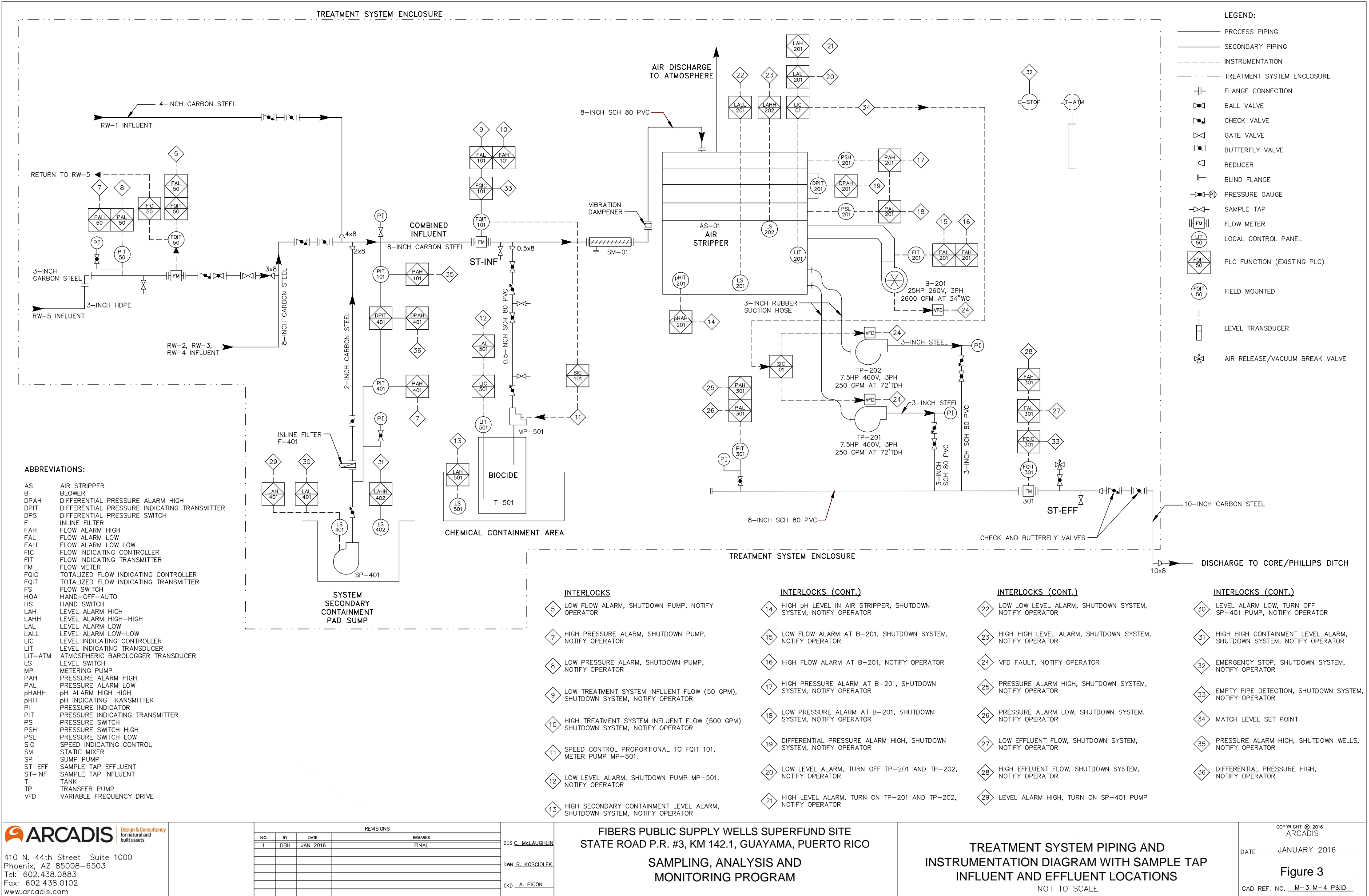


Table 1
GWETS Monitoring and Sampling Location and Frequency
Fibers Public Supply Wells Superfund Site
Guayama, Puerto Rico

Location	Sample Tap	Monitoring Frequency ⁽¹⁾ and Type	Compound	Analytical Testing Method
Influent	ST-INF	Monthly Grab	VOC	USEPA Method 8260
Effluent	ST-EFF	Monthly Grab	VOC	USEPA Method 8260

Notes:

GWETS = Groundwater Extraction and Treatment System.

⁽¹⁾ Initial sample will be collected during system startup.

ST-INF = Sample Tap - Influent.

VOC = Volatile Organic Compounds and Haloethers.

USEPA = United States Environmental Protection Agency.

ST-EFF = Sample Tap - Effluent.